UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/941,427	08/28/2001	John Peterson	07844-485001	7346

21876 7590 06/18/2004

FISH & RICHARDSON P.C.
3300 DAIN RAUSCHER PLAZA
MINNEAPOLIS, MN 55402

EXAMINER	
ROSARIO-VASQUEZ, DENNIS	
ART UNIT	**PAPER NUMBER**
2621	

DATE MAILED: 06/18/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/941,427	Applicant(s) PETERSON, JOHN	
	Examiner Dennis Rosario-Vasquez	Art Unit 2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 August 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-30* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *28 August 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *2,5*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Specification

1. The disclosure is objected to because of the following informalities:

Page 1, line 21 the phrase "in one aspect" ought to be deleted.

Page 5, line 20 the phrase "image 330" aught to be changed to 340 for a proper correspondence with the subject matter.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shum et al. (US Patent 6,643,413 B1) and in view of Heckbert (Master's Thesis from the IDS).

Regarding claim 1, Shum et al. discloses a method for shifting perspective (Fig. 11 uses image based rendering as shown in figure 2 that allows a user to "desirably able to move and rotate a virtual camera 204 throughout the scene 200, as indicated by the arrows extending from the scene 204, so that the virtual camera represents a desired viewpoint of the object 202. An image representing this viewpoint of the object 202 is then rendered (col. 5, lines 55-60).") in a composite image derived from a plurality of images (Figure 6 is a mosaic image of 8 images with eight rays that represent depth information of images as mentioned in col. 1, lines 47-49. Note that

rays and images are used to represent an image with depth information because the rays or depth information when available provide additional information for the images as mentioned in col. 1, lines 37,38.) including a first image (The ray of figure 6 with the angle θ represents depth information of a first image on the mosaic 602.) and a second image (The ray of figure 6 pointing vertically downward is a second image.), the composite image including the first image as a center of projection (A virtual camera located in the center of figure 6 is positioned, in the step of figure 11,num. 1104, on the first image as the current position as mentioned in col. 13, lines 34,35 for rendering and displaying an image in the steps of fig. 11, numerals 1106 and 1108, respectively.) and a modified version of the second image (The second image is warped or modified to the first image, in the step of fig. 11, num. 1106, because the second image's corresponding ray is closer to the first image's corresponding ray as mentioned in col. 1, lines 37-42.), the modified version of the second image being corrected for perspective distortion relative to the first image (The vertically downward ray of figure 6 represents depth information or perspective information that is warped to the first image for a continuous motion between views mentioned in col. 9, lines 46-49.), the method comprising:

a) receiving an instruction to shift perspective (In the step of fig. 11, num. 1104, a virtual camera is used to shift from a current position or first image(or the arrow with θ in fig. 6.) on a mosaic to a new position or the second image (or the vertically downward arrow of fig. 6.) on the same mosaic as mentioned in col. 13, lines 34-35 .) to make the second image the center of projection of the composite image (The virtual

camera is now positioned in front of the second image. The virtual camera was initially positioned in front of the first ray with θ.).;

b) determining a transformation (or warping is the only transformation used as mentioned in col. 1, lines 40-42 and col. 9, line 46-51.) for a set of reference points in the modified version of the second image (Transforming the mosaic 602 of figure 6 from one coordinate space to another as shown in figure 10, the set of reference points in the modified version of the second image are shown by the curved line of sampled points 1006. Note that the horizontal double headed arrow on "r sub. 1" correspond to a continuous movement on the mosaic 1006 or the mosaic of figure 6, num. 602, and continuous movement corresponds to a warping between other close rays (not shown in figure 10 and shown in figure 6.) as mentioned in col. 9, lines 49-51.) to a corresponding set of reference points in second image (The intersection at the point on the composite image or curved line1006 and ray 1002 is a view of the second image.); and

c) transforming the first image and the modified version of the second image based on the transformation to generate a modified version of the first image and the second image. (Once the virtual camera is positioned by a user from the fist image (Figure 6 has a ray with θ as the first image) to the second image (Figure 6 has a vertically downward arrow as the second image) the first image is warped to the second image because the first ray is the closest or local ray to the second ray as mentioned in col. 1, lines 40-42, col. 8, lines 8,9, col. 9, lines 49-51 and col. 13, lines 41-44.)

Shum et al. does not teach a mapping between images, but Shum et al. does teach extracting a set of points, such as a first portion of the curved line of fig. 10, num. 1006) for a corresponding view (or a new view from a second portion of fig. 10, num. 1006 that is different from the first extraction of points.) as mentioned in col. 8, lines 10-12.

However, Heckburt, in the field of endeavor of image mapping, does teach a mapping ("bilinear mapping" of figure 2.5 on page 15) of points (Figure 2.5 on the right side has four points labeled "p00,p01,p10 and p11) between images (Figure 2.5 has a source image on the left side and a destination image on the right side.) or planes as shown in page 15, figure 2.5.

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify the curve line that represents a mosaic (Fig. 6, 1006) and a ray (Fig. 6, num. 1002) that represents the depth of the image of Shum et al. with the teaching of Heckburt's mapping, because Heckburt's mapping provides a predictable transformation between images. Therefore users in 3D modeling and image distortion software can use the mappings to provide predictable features (lines, equispaced points, and angles) that are persevered (Heckburt, page 11, Section 2.2).

Regarding claim 2, Shum et al. and Heckburt teaches the method of claim 1, further comprising:

merging the modified version of the first image and the second image to form a second composite image that has the second image as its center of projection. The step of figure 11, num. 1108 renders the new image using the second image with the

first image modified or warped to the second image upon the movement of the virtual camera that creates a current positioned that is positioned in front of the second image that has a the first image warped to the second image.

Regarding claim 3, Shum et al. and Heckburt teaches a third image (Fig. 6 has a ray in the diagonal bottom right position that represents the third image.) that is warped in the same way as first image of claim 1 because the third image is also a ray that is closest to the second image (the vertically downward ray.) when the virtual camera is positioned in front of the second image.

Regarding claim 4, Shum et al. and Heckburt teaches the method of claim 1, wherein:

a) the reference points in the modified version of the second image include four non-collinear and non-coincident points in the modified version of the second image (Heckburt, figure 2.8 is a projective mapping of four corner points (labeled 0,1,2 and 3 of the quadrilateral or trapezoid figure on the left side.) that are in different positions and form a non-linear line that is modified from the corresponding middle figure.; and

b) the reference points in the second image include four non-collinear and non-coincident points in the second image as shown in Heckburt, fig. 2.8, middle figure is a square or rectangle.

Regarding claim 5, Shum et al. and Heckburt teaches the method of claim 1, wherein:

a) the second image and the modified version of the second image each include a perimeter as shown by the bold lines of figure 2.8 of Heckburt.

b) the reference points in the second image and the modified version of the second image are vertices on the perimeters on the second image and the modified version of the second image. Heckburt states," In an interactive image warper one might specify the four corners of source and destination quadrilaterals...and wish to warp one area to the other...[as mentioned in claim 4] (Heckburt, page 19, first sentence of the section "Inferring Projective Mappings". Figure 2.8 of Heckburt shows how the four vertices are transformed from case 1 to case 3.)

Regarding claim 6, Shum et al. and Heckburt teaches the method of claim 5, wherein:

a) the first image includes a plurality of pixels and has a perimeter that defines a set of vertices which was addressed in claim 5; and

b) transforming the first image based on the transformation includes:

b1) transforming the vertices of the first image (Using fig 2.8 of Heckburt, case three is shown where the vertices of the figure on the left side of figure 2.8 is transformed to the right-hand figure of figure 2.8.); and

b2) transforming the pixels of the first image based on the transformation of the vertices which was addressed in claim 5.

Regarding claim 7, Shum et al. and Heckburt teaches the method of claim 6, wherein:

The transformation is represented as a transformation matrix or (M sub. sd) is a forward mapping matrix as mentioned in Heckburt, page 19, section:" Inferring Projective Mappings", line 7.

Regarding claim 8, Shum et al. and Heckburt teaches the method of claim 7, wherein:

The transformation matrix is derived from the vertices of the modified version of the second image. Heckburt teaches that all points in one image (u sub. k, v sub. k) is mapped to other points (x sub. k, y sub. k) in a corresponding image using vertices (k=0,1,2,3) for each point.

Claim 9 was addressed in claim 8.

Regarding claim 10, Shum et al. and Heckburt teaches the method of claim 9, wherein the transformation matrix,M, is given by the matrix equation shown in Heckburt, page 19.

Claims 11 and 13 have been addressed in claim 4.

Regarding claim 12 a reference point ("1") in the left-hand figure shown in Heckburt, fig. 2.8 is moved to another position as shown in the figure of 2.8 on the right-hand side is move relative to other reference points 0,2, and 3 to change the shape of the figure on the left side of figure 2.8 to the figure on the right-hand side of figure 2.8.

Regarding claim 14, Shum et al. and Heckburt teaches the method of calim 1, wherein:

a) the instruction to shift perspective is received as a single user input(A user moves a virtual camera(Shum, fig. 2, num. 204) during the step of figure 11,num. 1104 of Shum et al. to change the current view to a new view as mentioned in Shum et al. col. 13, lines 34,35; and

b) the determining and transforming steps are automatically performed in response to the user input (A user is able to move and rotate the virtual camera that has a desired view of an object. The desired view is "then rendered" as mentioned in Shum et al., col. 5, lines 55-60. Thus as the virtual camera's current view is moved a corresponding image view is rendered using the method of figure 11.)

Regarding claim 15, the combination of Shum et al. and Heckburt teaches all the limitations as discussed in claims 1, 2, 3, and 14 and a computer-implemented image processing method (Shum et al., fig. 1 is a computer that processes the method of fig. 11 of Shum et al.).

Regarding claim 16, the combination of Shum et al. and Heckburt teaches all the limitations as discussed in claims 1, 2 and 3 and a computer program product, tangibly stored on a computer-readable medium (Shum et al., fig. 1, num. 29,31) that is provided to a processor (Shum et al., fig. 1,num. 21).

Claim 17 has been addressed in claim 2.

Claim 18 has been addressed in claim 3.

Claim 19 has been addressed in claim 4.

Claim 20 has been addressed in claim 5.

Claim 21 has been addressed in claim 6.

Claim 22 has been addressed in claim 7.

Claim 23 has been addressed in claim 8.

Claim 24 has been addressed in claim 9.

Claim 25 has been addressed in claim 10.

Claim 26 has been addressed in claim 11.

Claim 27 has been addressed in claim 12.

Claim 28 has been addressed in claim 13.

Claim 29 has been addressed in claim 14.

Regarding claim 30, the combination of Shum et al. and Heckburt teaches all the limitations as discussed in claims 1, 2, 3, 14 and 16.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Yano et al (US Patent 6,714,689 B1) is pertinent as teaching a method of aligning multiple images to a reference image as shown in figure 3.

Peleg et al. (US Patent 6,532,036 B1) is pertinent as teaching a method of creating a mosaic(fig. 6, num. 604) with one perspective point from multiple camera views (fig. 6, num. 601-603).

Shum et al. (US Patent 6,084,592 A) is pertinent as teaching a method of viewing a room using a 3D model (fig. 10N) and a mosaic image (fig. 10A) inlaid on the interior of the 3D model of figure 10B.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dennis Rosario-Vasquez whose telephone number is 703-305-5431. The examiner can normally be reached on 9-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo Boudreau can be reached on 703-305-4706. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

DJRV
Dennis Rosario-Vasquez
Unit 2621

LEO BOUDREAU
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600